There have been two occasions this month when marked falls in temperature have occurred. In each instance a sudden decline has been observed on the mountain, accompanied by a severe northwest gale, the greatest fall being from one to two days before the marked fall has occurred in northern California and Nevada.

The a. m. and p. m. observations of September 6 showed falls of 16° and 7°, respectively, at the mountain station and a northwest gale prevailed from the evening of the 5th to morning of the 8th. The p. m. observation of September 7, and a. m. of September 8, twelve hours later, showed changes of from 10° to 30° at all interior stations in Oregon, Idaho, California, Nevada, Utah, and Arizona, the fall being to freezing in western Oregon and northern Nevada. On the 13th a moderate northwest gale prevailed, but no fall in temperature occurred here or in northern California. On the 14th, however, the temperature fell from 8° to 15° throughout the greater portion of Oregon, Nevada, Utah, and Arizona. On the 20th a moderate gale sprung up from the northwest, and on the morning of the 21st quite a moderate fall in temperature occurred. The p. m. observation showed a similar fall in the interior valleys of California. The a. m. observation of the 26th showed an abrupt decline of 23° on the mountain, accompanied by a northwest gale, which continued until the night of the 27th, the temperature continuing low. On the morning of the 26th changes of from 8° to 10° were reported from Redbluff, Fresno, and Carson City, which were followed by further declines until the p. m. observation of the 27th, which showed changes aggregating from 14° to 30° in the interior of the State, and on the evening of the 28th and the morning of the 29th changes of from 10° to 20° occurred in western Oregon, Idaho, Nevada, and Utah, resulting in freezing weather in northern Nevada.

While the barometric conditions accompanying northers in California are quite well understood, it has frequently been impossible to accurately predict the time when the temperature will begin to rise upon the approach of a "norther," and likewise to determine the date of its ending. Frequently the wind will be high from the north in the valley for several days and no marked change in temperature will occur, and again it will begin to rise with the first north wind. From my observation this month I believe the conditions on the mountain will aid materially in these forecasts. Usually during warm weather in the interior there is a most remarkable temperature inversion between this station and the city. At times the temperature here is more than 20° warmer than at the base of the mountain. The anomaly is so great as to cause the correction of the barometer for elevation, based on the mountain temperature, to be too small by nearly 0.10 of an inch. With the passage to the northward of a high from the sea to the interior (the usual norther condition) there is at first, here, a northwest gale, accompanied by cool weather, during which time there is no rise in temperature in the interior valleys, but as the gale diminishes the wind shifts to north or northeast, and the temperature begins to rise, although the wind may still be west on the coast below, and no change in direction occurs in the valleys. Likewise, in cooling after the passage of the "norther" no marked change will occur until the temperature falls on the mountain with a return of westerly wind.

Further, it seems likely that this remarkable temperature inversion will furnish the key to an explanation of the fogs which prevail so frequently at San Francisco and at other points on this coast, and perhaps lead to a means of more satisfactorily forecasting the commencement of each period and its severity. The temperature inversion occurring, as it does, with an area of high pressure to the northward, is certainly evidence of an overflow of warm air from the interior toward the coast. This results from the less density of the hot air of the interior compared with the colder air over the ocean, which apparently causes a reversal of pressure gradients at a moderate elevation, and the warm air of the interior is carried westward over the sea, where it must rapidly give up its surplus heat, at the same time sinking toward the surface. Thus, a local circulation is set up between the valleys and the sea near the shore. As the warm air passes over the sea it receives moisture by evaporation, at the same time lowering its temperature until the amount received is in excess of what it can hold as vapor when cooled to the sea temperature and fog results.

While I have not had the time to carefully study this question as yet, I have observed many evidences of this tendency for a reversal of air movements with elevation during heated periods in the interior and preceding and during foggy periods on the coast. Among these evidences are the inversion of temperature and the decidedly smaller proportion of westerly winds on such occasions at this elevation than in the city. Frequently east and northeast winds prevail here during at least a portion of the day, while such is very seldom the case in the city.

In making this report I have confined my attention to conditions made manifest at this station, and not so observable elsewhere. Also, I have referred to merely those conditions of which it would seem that the knowledge gained by this station gave promise of an improvement of forecasts. It must be remembered that I have had no opportunity of observing during a winter storm and for but one month in summer, but I am sure the additional information obtained of summer rains, so injurious to drying fruits and raisins, and the warnings given of cold waves, which a little later in the autumn and in the early spring result in the destructive frosts, are sufficient to warrant the maintenance of this station.

I have not referred to the opportunities here offered for the investigation of many subjects of interest to the science of meteorology outside of those useful to the forecaster, although this peak, at the extreme western edge of the continent, is well adapted to such purpose.

Among other uses which will render the station valuable must be mentioned the possible use of it as a reporting station of vessels approaching this port.

NOTES BY THE EDITOR.

OLD WEATHER RECORDS.

In the "Transactions" of the New York State Agricultural Society for the year 1859, there is published an elaborate report by the Hon. George Geddes, of Fairmount, on the history, geology, climate, and agriculture of Onondaga County. In this Report, at page 296, Mr. Geddes states:

> Observations of the temperature have been taken at Fairmount at a point 520 feet above the sea for more than sixty years; and during that time a standard instrument in the shade, protected from all reflection, has never been observed to mark more than 94° in the hottest weather, and this but once in many years; and there have been but few days in the coldest weather that the mercury was not, at some time in the day, above zero. February 5 and 6, 1855, were the coldest days ever known here (February 5, 6 a. m., 28° below zero; February 6, 6 a. m., 30° below zero). During this unprecedented weather the sky was nearly cloudless, and as there was no wind, the severity of the weather was not so apparent.

As Mr. Geddes was a resident of Fairmount it seems plausible that he refers to some record of the temperature kept at that place by members of his own family, but so far as we can learn this temperature record for Fairmount is not referred to in any of the published tables of temperature data for the State of New York. A record that began about the year 1800 and was continuous until 1859, or later, would be of great value in climatological studies, and if this record still exists it should be not only preserved but made accessible for the use of students of climatology.—[C. A.]

RECENT EARTHQUAKES.

September 18, at Brigham City, Utah, 10:45 a. m.

September 25, throughout eastern Maine, as follows: Bangor, 1:05 p. m., lasting ten seconds, heavy rumbling noise and alarming shaking of houses; Thomas hill, highest part of Bangor, 1:07 p. m.; Brewer, more severe than in Bangor; Bingham and Somerset, about 1:00 p. m.; Solon and neighborhood, lasted four seconds; Belfast, two shocks at 1:05 p. m., the first lasting *five* and the second lasting *ten* seconds; also felt in the neighboring towns of Winterport, Brooks, Searsport, Liberty, Burnham, City Point, Swanville, and Waldo; Farmington, 1:03 p. m., lasting five seconds; Rockland, a few minutes after 1:00 p. m., and at all places in its neighborhood.

September 2, St. Thomas, W. I., at 11:30 a. m., a rather sharp earthquake shock of scarcely any duration, commonly known here as a "rumble and a jerk."—[C. A.]

DEPTH OF HAIL FALL.

It is very common for observers to state that hail fell during a given storm, and to specify the size of the hailstones, but no measurement or estimate is given as to the quantity of hail, expressed in depth of fall, as is done in the case of snow and rain. During the past summer several remarkable falls of large hailstones have been reported, as in the subjoined list. In each of these and in similar cases it is desired to know how large an area is covered by the hail and what would be the depth of the equivalent uniform layer of solid ice uniform over the whole area. In the case of the storm reported by Mr. Jennings, at Topeka, Kans., a photograph was sent to the Editor, which appeared to show that over a portion of the landscape the hailstones lay upon the ground just about contiguous to each other, and the stones averaged, from the observer's own measurement, 4 inches in diameter. The thickness of the equivalent layer of ice is, therefore, the depth to which each sphere would cover its corresponding regular circumscribed hexagon. Now, the volume of the sphere is 4/3 by 3.1416 times the cube of the radius; the area of the circumscribed hexagon is 2 by 1.7320 by the square of the radius. Therefore, the sphere of ice will cover its hexagon to the depth of 1.209 multiplied by the radius of the sphere. In other words, a layer of contiguous spheres of ice 4 inches in diameter is equivalent to a solid layer of ice 2.418 inches thick. A layer 7 inches deep of hailstones a quarter of an inch in diameter, or one-eighth of an inch radius, would be equivalent to about 1.06 inch of ice. The factor 1.209 will enable any observer to convert his hail fall into an equivalent sheet of ice. The remarkable hailstorms to which we have alluded were the following:

Topeka, Kans., 1897, June 24, first thunder heard at 6:55 p. m. in the north and the last at 8:45 p. m. in the south; wind before the storm, south, after the storm, northeast; temperature before the storm, 88°, afterwards, 72°; hail began at 7:35, ended, 7:40 p. m., 4 inches in diameter; hail began again, 7:38, ended, 7:43 p. m., and 0.7 in diameter; hail began again, 7:48, ended, 7:50 p. m., 0.4 in diameter; rain began at 7:35, ended, 8:15 p. m.; total amount, 0.28. While the big hail was falling the observer measured a dozen, with the following resulting diameters: 6.00, 5.25, 5.00, 4.75, 4.00, 3.50, 3.00; the average being 4.00 inches. Some of the largest stones were merely aggregations of small stones, while many of them were solid ice in layers, like an onion; one, weighing 2 pounds, went through the roof of the electric power house. The barometer rose 0.2 inch and returned to its former reading. The temperature fell from 88°, at 6:30, to 79°, at 8 p. m., and then, in a few moments, to 69°, the pen rising and falling over the same space until it had badly blurred the record. The wind whipped to north as the hail began and attained a maximum velocity of 35 miles, which, however, did not extend to the western limits of the city. Many stones emitted light on striking the hard pavement.

Pueblo, Colo., June 24, first thunder, 7:44 p. m.; storm came from the southwest and moved toward the northeast; temperature before the storm, 78°, afterwards, 63°; maximum wind during the storm, 36 miles, from the northeast; hail began at 8:15 and ended at 9 p. m.; it began again at 11:25 and ended at 11:40 p. m. The largest seen by the observer measured one-half inch in diameter and was conical in shape, as were most of the stones that were examined. The hail was much heavier in the southern portion of the city, and for a few miles southward, where lumps of ice measuring 3¾ inches in diameter and weighing 8¾ ounces were reported.

An account of a remarkable hailstorm is buried in the Transactions of the American Institute for the years 1864–65, Vol. XXIV. We quote from page 323 of that volume. Mr. J. M. Root described the hailstorm of June 10 ?, 1849, on the great plains of western Nebraska, 50 miles east of Fort Laramie (N. 42° 12′, W. 104° 31′, in eastern Wyoming). Some of the stones which fell measured 14 inches in circumference; they were composed of solid ice with smaller portions adhering to them; he noticed that some of these hailstones were of conical form and only about 3 inches in circumference. The hailstorm lasted from ten to fifteen minutes. On the same page Mr. Maynard describes the hail that fell in New York City in August, 1862, as having had a conical shape, while others were described by Dr. Rowell as concave and resembling somewhat a rough oyster shell.—[C. A.]

HIGH LEVEL STATIONS IN JAMAICA.

The publications of the Weather Office at Kingston, Jamaica, consist of monthly or occasional bulletins published first in the Jamaica Gazette and reprinted as a regular series of reports, and annual summaries published in the official "Handbook of Jamaica" especially for 1881 and 1893. These publications give in detail the observations made at Kingston at 7 a.m. and 3 p. m. daily, also a monthly summary for seven stations as to pressure, temperature, wind, and cloud; the monthly rainfall and extremes of temperature for Blue Mountain Peak (7,423 feet above sea level) and, finally, the monthly rainfall data for about 250 stations distributed over the whole island. No detailed observations are made at the summit of Blue Mountain, owing to the expense of maintaining an observer on this place, which is not easily accessible; the monthly record is obtained by ascending the peak as nearly as possible on the last day of each month. Until the establishment of a permanent station on some peak, such as St. Johns (6,100) or Blue Mountain (7,423), it is probable that the station at the Cinchona Plantation, called Hill Gardens (N. 18° 5′, W. 76° 39′; altitude, 4,907 feet), will continue to be the highest on the island; it is about seven miles west-southwest of the summit. We are pleased, therefore, to have the privilege of publishing a portion of the record for Hill Gardens in detail, in lieu of that for any higher station, inasmuch as the changes going on in the upper strata undoubtedly work downward toward the earth's surface and will, when we have learned to properly interpret them, enable us to understand the storms and weather of the lower strata.—[C. A.]